City of Broken Bow WER Study for Copper, Lead, and Zinc
EPA Region 6 Comments on:

A. Initial Data Provided by OWRB to EPA via Email Dated January 9, 2014
B. Lead Precipitation and High Flow Sampling Location Issues (Described in Jonathan Brown's (GBMc) Email Forwarded by OWRB to EPA on January 15, 2014)

The comments below represent EPA Region 6's comments on the initial data and technical issues referenced above. Until a completed final report is available, EPA cannot comment on the technical adequacy of any final WERs.

A. Comments on Initial Data

1. Hardness Normalization in WER Testing Rounds #1-3. Since all of the effluent LC50s were normalized to the hardness of the lab water, there is no need to normalize the lab water LC50s. As such, hardness normalization for the lab water LC50s prior to calculation of the WERs is not appropriate. The WERs for lead and zinc should be calculated by dividing the normalized effluent LC50s by the non-normalized lab water LC50s, as reflected in the recalculated WERs for lead and zinc shown in the table below. (Note that the WERs for copper do not need to be recalculated because both the SMAVs and effluent LC50s for copper were normalized to the same hardness).

Pollutant	*C. dubia*			*P. promelas*
	Round #1	Round #2	Round #3	Round #3
Total Lead	1.22	4.17	12.65	>0.58
Dissolved Lead	0.41	1.74	6.46	>1.17
Total Zinc	0.75	1.88	9.48	1.94
Dissolved Zinc	0.56	1.65	8.49	1.69

2. Round #1, Lead WERs for *C. dubia*. The file titled "WER Results Summary.xls" indicates that the lead WERs for *C. dubia* from Round #1 of testing will not be included in the final WER calculations. EPA would like to better understand the rationale for excluding these WERs.

   The file titled "WER Sampling #1 Results.xls," includes the following note regarding the lead WERs for *C. dubia*: "Did not produce sufficient adverse response. No LC50 or WER can be calculated." Is this statement saying that the lab water did not produce a sufficient adverse response, or the effluent?

   The lab water in Round #1 produced a similar adverse response (i.e., LC50) as in Round #2 of testing, but the summary spreadsheet indicates that the lead WERs for *C. dubia* from Round #2 will be included in the final WER calculation. This indicates that GBMc meant for the above-referenced note to refer to the effluent (i.e., that the effluent did not produce a sufficient adverse response). Also, the effluent in Round #1 did not produce a similar adverse response as in Rounds #2 and #3 (LC50s in Round #1 were much lower), which further

indicates that GBMc meant that the effluent in Round #1 did not produce a sufficient adverse response.

If GBMc meant that the effluent in Round #1 did not produce a sufficient adverse response, please explain why the response was not sufficient. Does GBMc doubt the LC50 result because it believes lead precipitation issues affected the LC50s (i.e., caused them to be too low)? Or, do the low LC50s represent a "true" adverse reaction due to lead? (If so, then the LC50s should be included in the final WER calculation.)

In summary, the final WER report should provide a clear explanation/description for why the lead LC50s for *C. dubia* in Round #1 of testing are not included in the final WER calculations.

3. Round #3, Lead and Zinc WERs for *C. dubia*. Several observations about lead and zinc WER testing for *C. dubia* in Round #3 indicate that these results should be further investigated. [See page 61 of the 1994 Interim WER Guidance.] For example, these lead and zinc WERs are larger than 5 and significantly higher than those from Rounds #1 and #2. And, these lead and zinc WERs for *C. dubia* in Round #3 are more than 3x higher than the lead and zinc WERs for *P. promelas* in Round #3. (Side note: we recognize there may have been issues with the lead WERs for *P. promelas* in Round #3, as discussed in Comment 4 below.)

   Upon further investigation, EPA noted that the lead and zinc lab water LC50s for *C. dubia* in Round #3 are significantly lower than those obtained in Rounds #1 and #2. And, the lead and zinc lab water LC50s for *C. dubia* in Round #3 are significantly lower than the SMAVs for *C. dubia* in EPA's 1987 zinc criteria document and for *D. magna* in EPA's 1984 lead criteria document (no SMAV for *C. dubia* available in 1984 lead criteria document).

   Given the above concerns, EPA believes Round #3 testing should be repeated to resolve this issue, unless GBMc has an alternative solution it would like to propose to address this issue. Based on the initial data provided, it looks like there were issues encountered when conducting the lead WER testing for *P. promelas* in Round #3, so it could be that GBMc was already envisioning repeating the third round (not sure).

   In summary, EPA believes the lead and zinc WERs for *C. dubia* from Round #3 of testing should be excluded from the final WER calculations.

4. Round #3, Lead WERs for *P. promelas*. First, in the file titled "WER Sampling #3 Results.xls," it is not clear if the same units are used in reporting the total versus dissolved lead LC50 results for *P. promelas*. (Note that this wouldn't affect WER calculations since WER calculations are simple ratios, but it is more transparent to use the same units when reporting results). Second, it appears that the same issues encountered with the lead WER testing for *C. dubia* in Round #1 were also encountered in lead WER testing for *P. promelas* in Round #3. As such, Comment 2 above also applies to the lead WERs for *P. promelas* in Round #3. Namely, the final WER report should provide a clear explanation/description for why the lead LC50s for *P. promelas* in Round #3 of testing are not included in the final WER calculations.

5. Final WER Calculations. As a reminder, the final WER calculations for lead and zinc should follow the decision tree presented on page 36 of EPA's 1994 Interim WER Guidance.

B. Comments on Lead Precipitation and High Flow Sampling Location Issues

1. Lead Precipitation Issue. Jonathan Brown's (GBMc) January 14, 2014, email requests input on the suggestion to use soft water in the laboratory control water instead of moderately hard water to help with the lead precipitation issue. Based on EPA's 1994 Interim WER Guidance (see Items F.3. and F.4 on page 50), we think this would be fine as long as the hardness of the lab dilution water is no lower than 40 mg/L and the alkalinity and pH of the lab dilution water is appropriate for the hardness (e.g., see Table 7 on p. 33 of EPA's 2002 *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*).

   However, we have a follow-up question. Is the suggestion to use soft water in the laboratory control water meant to address:
   1) the issues encountered with the lead WER results for *C. dubia* in Round #1 and for *P. promelas* in Round #3 (discussed in Comments 2 and 4 above), or
   2) the low lead and zinc lab water LC50s for *C. dubia* in Round #3 (discussed in Comment 3 above).

   If the suggestion is meant to address the former (i.e., (1) above), then EPA would like to better understand why GBMc believes using soft water in the lab water tests will resolve the issues encountered with the lead WER results for *C. dubia* in Round #1 and for *P. promelas* in Round #3. Based on EPA's review of the initial data (see Comments 2 and 4 above), it appears that the lead precipitation issue may have affected the effluent tests rather than the lab water tests.

2. Sampling Location for Type 2 (High Flow) WER. Jonathan Brown's January 14, 2014, email requests input on the issue of moving the upstream sampling point from the unnamed tributary just upstream of the wastewater plant to Yannube Creek, upstream of the confluence with the unnamed tributary. On January 15, 2014, Region 6 sent an email to EPA headquarters to seek additional input on this issue. In the meantime, here are Region 6's initial thoughts/follow-up questions. We will let OWRB know when we receive additional input from headquarters.

   Region 6 Initial Thoughts/Follow-up Questions:
   In reading through EPA's 1994 Interim WER Guidance, we couldn't find any information therein that directly addresses this particular situation. We did notice that Option 1b on page 36 of the 1994 guidance does provide an option for calculating a final WER "if less than 19% of all the WERs are Type 2 WERs." In this case, since all of the currently available WERs for lead and zinc would be Type 1 WERs, Option 1b would mean that the lowest of (at least three) Type 1 WERs should be the final WER. In other words, a Type 2 WER is not absolutely needed to determine a final WER (but is to the City's benefit because Option 1a could be used if a Type 2 WER was available and Option 1a generally produces a higher final WER).

The above said, we think GBMc's proposed approach, in theory, could be appropriate if the water quality characteristics of Yannube Creek during a high flow event were representative of the water quality characteristics that would be present during a similarly high flow event for the unnamed tributary. However, since such data is not available, it is probably prudent to presume that the water quality characteristics of the two sites could differ. As such, there would be uncertainty about whether the WER results would truly represent what is actually occurring in the unnamed tributary and Yannube Creek.

The above uncertainty issue aside, Region 6 is also not certain how the two waters (Yannube Creek and 100% effluent) would be combined to create the site water for WER testing. Generally, if the upstream water were collected from the unnamed tributary to Yannube Creek, then this water would be combined with the effluent at whatever ratio represents the ratio of the two flows in the unnamed tributary downstream of the City's discharge (i.e., at the ratio present during the high flow event).

However, under GBMc's proposed approach, the upstream water would be from Yannube Creek, not the unnamed tributary. To combine water from Yannube Creek and 100% effluent would be to presume that the entire flow of unnamed tributary (even during a precipitation event) is made up of only effluent.

For the high flow sampling event, wouldn't it be more appropriate to either (1) combine water from Yannube Creek (upstream from where the unnamed tributary joins in) and water from the unnamed tributary downstream of the City's discharge at the appropriate ratios or (2) collect a sample from Yannube Creek downstream from its confluence with the unnamed tributary and test this water directly? Either of these approaches would at least tell us something about what WER would be appropriate to protect Yannube Creek downstream of the confluence with the unnamed tributary during a high flow event.